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Long-term exposure to particulate matter air pollution and the risk of graft failure and mortality in kidney transplant recipients

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Objectives: Elevated levels of fine particulate matter, 10-μm in aerodynamic diameter (PM10) are associated with increased risk of incident chronic kidney disease, estimated GFR decline, end stage renal disease (ESRD) and death. However, the association between PM10 and risk of graft failure, all-cause mortality, and biopsy-proven acute rejection (BPAR) in kidney transplant recipients (KTRs) has not been studied.

Methods: Air pollutant data were obtained from the Korean National Institute of Environmental Research and it was linked to the 1,531 KTRs who received kidney transplantation in Seoul National University Hospital from 2001 through 2015. We used survival models to evaluate the association of PM10 concentrations and risk of graft failure, all-cause mortality, and BPAR over a median follow-up of 6.36 years. The exposure was defined at baseline as the 1-year average PM10 concentrations retrospectively from the event day individually, and the exposure duration was extended annually up to 4 years.

Results: During the study periods, annual average PM10 exposure after KT varied ranging from 28.3 to 73.27 μg/m^3 (mean, 52.5 μg/m^3). In analyses of 1-year baseline exposure, a 1-μg/m^3 increase in PM10 concentration was associated with increased risk of graft failure (hazard ratio [HR], 1.05; 95% confidence interval [95% CI], 1.01 to 1.10) and BPAR (HR, 1.06; 95%CI, 1.05 to 1.07), and this trend was consistent even if the exposure period was increased annually to 4 years. All-cause mortality was significantly associated with 4-year average PM10 concentrations before the event (HR, 1.10; 95% CI, 1.03 to 1.16) in a fully adjusted models.

Conclusions: Our findings demonstrates a significant association between the long-term exposure to PM10 and the risk of graft failure, all-cause mortality, and BPAR in KTRs